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various carbohydrates deflected pollen tubes, and in 1899 LIDFORSS reported that they were responsive also to certain proteins. In the last ten years, with the exception of a few papers by the same author, nothing has appeared on the responses of pollen tubes. Now LIDFORSS, who has been prosecuting his researches year after year, in the short periods available each season for any particular plant, presents the results in detail.¹¹ First he discusses the effect of various chemical agents upon the germination of the pollen. In the section on proteo-chemotropism, LIDFORSS lists the large number of proteins of various groups that have yielded definite results. In general it may be seen that the pollen tubes are indifferent to cleavage products of proteins, and are harmed by the albumoses and peptones tried. On the contrary, to the albumins, globulins, nucleo-albumins, coagulated proteins, and glycoproteins, nineteen in all, the tubes respond by positive curvatures. The nucleo-proteins differ much, some being attractive, some apparently indifferent, and some poisonous. Besides the tropic action of the proteins, they accelerate the growth of the tubes, which also tend to branch in some cases. The reaction time in most favorable cases for *Vallota purpurea* is less than 5 min., and for *Narcissus Tazetta* and *Tradescantia virginica* less than 2-3 min. The liminal value of the concentration was difficult to determine. In the case of diastase with *Vallota purpurea* it was about 0.1 per cent. Only one case of apochemotropism with proteins was observed (*Scilla campanulata* with diastase), and as this could not be confirmed by later experiments it was possibly due to some impurity of the diastase used. Proteo-chemotropism has been found in 13 families of monocots and 42 families of dicots, so that it may be considered as of general occurrence in angiosperms.

Saccharo-chemotropism was not investigated extensively by LIDFORSS, but his limited observations, combined with those of MIYOSHI, make it probable that responses to various carbohydrates are also general among angiosperms. Osmotropism was clearly shown by some tubes, and the author promises a later paper on this subject. In a special part, an appendix to the body of the paper, there are details regarding all the species of pollen studied, as to favorable conditions for germination and the responses obtained. These furnish useful details for laboratory directions in employing these experiments in instruction.—C. R. B.

Persistence of characters in Aspergillus.—KOMINAMI¹² has investigated the persistence of characteristics induced in *Aspergillus niger* by subjecting that mold to unusual cultural conditions, in this case strong solutions of common salt. The conidia used in the experiments were obtained from three strains: (1) from cultures on normal nutrient media; (2) from cultures grown for one generation on nutrient solution containing 6 per cent. of salt; and (3) from cultures grown for

¹¹ LIDFORSS, B., Untersuchungen über die Reizbewegungen der Pollenschläuche. I. Der Chemotropismus. Zeit. Bot. 1:443-496. pls. 3. 1909.

¹² KOMINAMI, K., Biologisch-physiologische Untersuchungen über Schimmelpilze. Jour. Coll. Sci. Tokyo 27:1-33. pls. 3. 1909.

ten generations on media containing 5 or 6 per cent. of salt. Conidia from each of these strains were sown in solutions containing 20.4 to 22 per cent. of salt. It was found that conidia from strains which had previously been accustomed to 6 per cent. salt solution germinated more rapidly and grew more vigorously than conidia from normal solutions. Conidia from the strain accustomed for ten generations to salt showed the same effect in a more pronounced manner. When conidia from all strains were sown on normal nutrient solution, the strains adapted to salt grew more poorly and consequently fruited sooner than the strains not adapted. When all strains were sown on salt solution, the reverse effect was observed. The accommodation to salt solution did not disappear after ten generations of culture on normal media. Attempts to establish persistency of accommodation to higher osmotic pressures and to some poisons gave negative results.

The author has attacked this problem, as he states in the introduction, from the standpoint of inheritance of acquired characters. It seems doubtful if the idea of inheritance can be applied perfectly in such cases as described in the foregoing, where the whole protoplasm in the organism is modified by a factor in the environment, and a part of this modified protoplasm passes into the conidium—an asexually formed bud of the original stem. So long as no sexual process intervenes, the succeeding "generations" must be looked upon as a continuation of the original plant. Therefore, organisms with only asexual reproduction are not well suited to the study of the inheritance of acquired characters. That some of the characteristics should not be lost readily, i. e., that the organism should not readapt itself readily to the former condition, may appear unusual, but it is possible that the reactions by virtue of which the accommodation occurs are not readily reversible. If this principle were general, it would lead to the existence of numerous physiological races. Such races are common among parasitic fungi, and it may be that they are even more numerous and as highly specialized among the saprophytes.—H. HASSELBRING.

Tubercle bacteria.—DE'ROSSI working at Perugia has been investigating anew the *Bacillus radicicola* of BEIJERINCK, and has reached results so at variance with those of previous observers as to need ample confirmation.¹³ His conclusions may be stated briefly as follows:

An examination of the literature convinces him that many observers have mistaken *germi banali* of the soils for the real *B. radicicola*; and others have worked with impure cultures of it. The certain isolation of the true germ is attained by spreading the contents of a tubercle on a plate of gelatin with a leguminous extract containing glucose, and rejecting the colonies which develop rapidly, in favor of those which become visible to the microscope on the fifth or sixth day and to the eye on the tenth to twelfth, the form really desired being apparently a contaminant. These show the true morphological, cultural, and biological characters of *B. radicicola*.

¹³ DE'ROSSI, G., Studi sul microorganismo produttore dei tubercoli delle leguminose. Annali di Botanica 7:617-669. pl. 23. 1909.